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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/756,846	01/10/2001	Katsunobu Hori	50090-270	6055

7590 01/14/2003

McDermott, Will & Emery
600 13th Street, N.W.
Washington, DC 20005-3096

EXAMINER

VU, HUNG K

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 01/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/756,846

Applicant(s)

HORI ET AL.

Examiner

Hung K. Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) 6-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- ☐ Interview Summary (PTO-413) Paper No(s). _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

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DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Akira (JP4-372133, of record).

Akira discloses, as shown in Figures 1(a) - 1(d), a semiconductor device comprising,

a thick film wiring (7) having a first film thickness;

a thin film wiring (6) having a second film thickness that is smaller than the first film thickness;

a hard mask (4) covering the surface of the thick film therewith;

wherein the hard mask is resistant to etching adapted for patterning of the thick film wiring and also to etching adapted for patterning of the thin film wiring, while being resistant to heat.

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Note that the term “formed in a single layer” is method recitation in a device claimed, and it is non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not.

With regard to claim 5, Akira discloses the thick film wiring serves as a wiring for an electric supply of the semiconductor device or as a wiring for ground.

2. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshihiko (JP2-264432, of record).

Yoshihiko discloses, as shown in Figure 2(d), a semiconductor device comprising,

- a thick film wiring (13, left) having a first film thickness;

- a thin film wiring (13, right) having a second film thickness that is smaller than the first film thickness;

- a hard mask (14,15) covering the surface of the thick film therewith;

- wherein the hard mask is resistant to etching adapted for patterning of the thick film wiring and also to etching adapted for patterning of the thin film wiring, while being resistant to heat.

Note that the term “formed in a single layer” is method recitation in a device claimed, and it is non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP

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2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

With regard to claim 5, Yoshihiko discloses the thick film wiring serves as a wiring for an electric supply of the semiconductor device or as a wiring for ground.

3. Claims 1 and 5 are rejected under 35 U.S.C. 102(e) as being anticipated by Schoenfeld et al. (PN 6,396,727, of record).

Schoenfeld et al. discloses, as shown in Figures 2, 4, 6 and 7, a semiconductor device comprising,

- a thick film wiring (region 20) having a first film thickness;

- a thin film wiring (region 22) having a second film thickness that is smaller than the first film thickness;

- a hard mask (18) covering the surface of the thick film therewith;

- wherein the hard mask is resistant to etching adapted for patterning of the thick film wiring and also to etching adapted for patterning of the thin film wiring, while being resistant to heat.

Note that the term "formed in a single layer" is method recitation in a device claimed, and it is non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP

2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

With regard to claim 5, Schoenfeld et al. discloses the thick film wiring serves as a wiring for an electric supply of the semiconductor device or as a wiring for ground.

4. Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Doan et al. (PN 5,346,587, of record).

Doan et al. discloses, as shown in Figures 4A and 4C, a semiconductor device comprising,

a thick film wiring (34, left) having a first film thickness;

a thin film wiring (34, right) having a second film thickness that is smaller than the first film thickness;

a hard mask (35,37) covering the surface of the thick film therewith;

wherein the hard mask is resistant to etching adapted for patterning of the thick film wiring and also to etching adapted for patterning of the thin film wiring, while being resistant to heat.

Note that the term "formed in a single layer" is method recitation in a device claimed, and it is non-limiting, because only the final product is relevant, not the method of making. A product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

With regard to claim 3, Doan et al. discloses the hard mask comprises a silicon nitride film.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akira (JP4-372133, of record) in view of Tao et al. (PN 6,399,515, of record).

Akira discloses all of the claimed limitations except the material of the hard mask comprises a silicon oxide film or a silicon nitride film. However, Tao et al. discloses a hard mask having the material comprising a silicon oxide film or a silicon nitride film. Note Figure 8 of Tao et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Akira having the material comprising a silicon oxide film or a silicon nitride film, such as taught by Tao et al. because a silicon oxide film or a silicon nitride film is commonly used as the mask to etch the layer formed below it.

With regard to claim 17, although Akira and Tao et al. do not disclose the hard mask is resistant to heat at 400°C, however, because Akira and Tao et al. disclose the material of the hard mask is the same as that of the hard mask of the invention, it is inherent that the hard mask of Akira and Tao et al. is also be able to resistant to heat at 400°C.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Akira (JP4-372133, of record) in view of Williams (PN 6,087,269, of record).

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Akira discloses all of the claimed limitations except the material of the hard mask comprises a tungsten film. However, Williams discloses a hard mask having the material comprising a tungsten film. Note Figure 6 of Williams. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Akira having the material comprising a tungsten film, such as taught by Williams in order to provide the advantage of increased resolution because of the thinner resist as well as the possibility of increased interconnect thickness which provides for greater current handling capability.

7. Claims 2-3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshihiko (JP2-264432, of record) in view of Tao et al. (PN 6,399,515, of record).

Yoshihiko discloses all of the claimed limitations except the material of the hard mask comprises a silicon oxide film or a silicon nitride film. However, Tao et al. discloses a hard mask having the material comprising a silicon oxide film or a silicon nitride film. Note Figure 8 of Tao et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Yoshihiko having the material comprising a silicon oxide film or a silicon nitride film, such as taught by Tao et al. because a silicon oxide film or a silicon nitride film is commonly used as the mask to etch the layer formed below it.

With regard to claim 17, although Akira and Tao et al. do not disclose the hard mask is resistant to heat at 400°C, however, because Akira and Tao et al. disclose the material of the hard mask is the same as that of the hard mask of the invention, it is inherent that the hard mask of Akira and Tao et al. is also be able to resistant to heat at 400°C.

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8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshihiko (JP2-264432, of record) in view of Williams (PN 6,087,269, of record).

Yoshihiko discloses all of the claimed limitations except the material of the hard mask comprises a tungsten film. However, Williams discloses a hard mask having the material comprising a tungsten film. Note Figure 6 of Williams. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Yoshihiko having the material comprising a tungsten film, such as taught by Williams in order to provide the advantage of increased resolution because of the thinner resist as well as the possibility of increased interconnect thickness which provides for greater current handling capability.

9. Claims 2-3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfeld et al. (PN 6,396,727, of record) in view of Tao et al. (PN 6,399,515, of record).

Schoenfeld et al. discloses all of the claimed limitations except the material of the hard mask comprises a silicon oxide film or a silicon nitride film. However, Tao et al. discloses a hard mask having the material comprising a silicon oxide film or a silicon nitride film. Note Figure 8 of Tao et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Schoenfeld et al. having the material comprising a silicon oxide film or a silicon nitride film, such as taught by Tao et al. because a silicon oxide film or a silicon nitride film is commonly used as the mask to etch the layer formed below it.

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With regard to claim 17, although Akira and Tao et al. do not disclose the hard mask is resistant to heat at 400°C, however, because Akira and Tao et al. disclose the material of the hard mask is the same as that of the hard mask of the invention, it is inherent that the hard mask of Akira and Tao et al. is also be able to resistant to heat at 400°C.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfeld et al. (PN 6,396,727, of record) in view of Williams (PN 6,087,269, of record).

Schoenfeld et al. discloses all of the claimed limitations except the material of the hard mask comprises a tungsten film. However, Williams discloses a hard mask having the material comprising a tungsten film. Note Figure 6 of Williams. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Schoenfeld et al. having the material comprising a tungsten film, such as taught by Williams in order to provide the advantage of increased resolution because of the thinner resist as well as the possibility of increased interconnect thickness which provides for greater current handling capability.

11. Claims 2 and 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Doan et al. (PN 5,346,587, of record) in view of Tao et al. (PN 6,399,515, of record).

Doan et al. discloses all of the claimed limitations except the material of the hard mask comprises a silicon oxide film. However, Tao et al. discloses a hard mask having the material comprising a silicon oxide film or a silicon nitride film. Note Figure 8 of Tao et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made

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to form the hard mask of Doan et al. having the material comprising a silicon oxide film, such as taught by Tao et al. because a silicon oxide film and a silicon nitride film is commonly used as the mask and they are interchangeable.

With regard to claim 17, although Akira and Tao et al. do not disclose the hard mask is resistant to heat at 400°C, however, because Akira and Tao et al. disclose the material of the hard mask is the same as that of the hard mask of the invention, it is inherent that the hard mask of Akira and Tao et al. is also be able to resistant to heat at 400°C.

12. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Doan et al. (PN 5,346,587, of record) in view of Williams (PN 6,087,269, of record).

Doan et al. discloses all of the claimed limitations except the material of the hard mask comprises a tungsten film. However, Williams discloses a hard mask having the material comprising a tungsten film. Note Figure 6 of Williams. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the hard mask of Doan et al. having the material comprising a tungsten film, such as taught by Williams in order to provide the advantage of increased resolution because of the thinner resist as well as the possibility of increased interconnect thickness which provides for greater current handling capability.

Response to Arguments

13. Applicant's arguments filed 10/29/02 have been fully considered but they are not persuasive.

It is argued, at page 4 of the Remarks, that the photoresist 7 of Akira is not the hard mask, as claimed. This argument is not convincing because the photoresist of Akira is used to etch the wiring 3. So it is also function as the hard mask.

It is argued, at page 4 of the Remarks, that Akira does not disclose the ability of the photoresist 7 to resist heat. This argument is not convincing because since the photoresist is function as the hard mask, it is inherent that the photoresist also resists heat.

It is argued, at page 5 of the Remarks, that the photoresist of Yoshihiko is not the hard mask, as claimed. This argument is not convincing because the photoresist of Yoshihiko is used to etch the wiring 3. So it is also function as the hard mask.

It is argued, at pages 5-6 of the Remarks, that the mask of Schoenfeld is not the hard mask, as claimed. This argument is not convincing because the mask of Schoenfeld is used to etch the wiring 3. So it is also function as the hard mask.

It is argued, at page 6 of the Remarks, that the gate electrode of Doan is not the wiring and the silicide is not the hard mask, as claimed. This argument is not convincing because the gate

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electrode of Doan is also the wiring and the silicide of Doan is used to etch the wiring. So the silicide is also function as the hard mask.

It is argued, at pages 7-12 of the Remarks, that the Examiner has not established a motivation to replace the photoresist of Akira with the hard mask of Tao. This argument is not convincing because the photoresist of Akira is also function as the hard mask and it is well-known that silicon oxide film and silicon nitride film are commonly used as the mask.

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-5:30, Eastern Time.

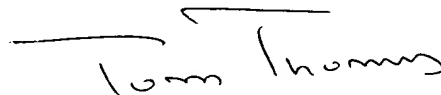
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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Vu

December 31, 2002



TOM THOMAS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800